How do students access and assess academic information?

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– A quick scan into information literacy at Maastricht University

Maastricht University

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This report has been written by Lea Maria Ferguson, academic tutor and writing coach at University College Maastricht; the project was guided by Henrietta Hazen, coordinator of scientific information and skills support at UB, and Frederike Vernimmen, head of education and research support at UB.

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Executive Summary

In their studies, university students should not only make use of the recommended literature provided by their course coordinators and tutors but also go beyond this with their own creative research. Being able to distinguish useful from misleading information is an important competence for students, instructors, and general citizens alike: gaining access to information means gaining access to power and ultimately to shaping the world we live in. This process of creating order, meaning, and purpose within the wide field of available (academic) information, and the ability to find answers to the questions one needs answered, is commonly referred to as information literacy (IL).

As an institution dedicated to facilitating effective research and fruitful education, the University Library Maastricht (UB) strives for an excellent course and tool offering. UB and Maastricht University (UM) strive to collaborate in developing 21st century competences to stimulate students' self-directed learning. Students work towards acquiring IL competences during their studies at university when researching and writing papers, as well as preparing classes and studying. Particularly in the problem-based learning (PBL) environment of UM, students can benefit from the competences of being able to critically assess and evaluate information in preparation for class discussions.

The main purpose of this quick scan is to investigate in how far students of UM have the ability to effectively access and critically assess academic information: to look into these questions, a short survey was distributed among UM students from April to May 2017. The results of the survey are intended to be distinct per faculty, discipline, study year, and type of programme (Bachelor's/Master's). The survey looks into the following questions: (a) Which search engines are being used (LibSearch, Google, Google Scholar, or other)?, (b) Which social communities or platforms are being consulted or used in order to share findings (i.a., Facebook, Sci-Hub, Dropbox)?, (c) How do students check authenticity, validity, and reliability of their findings?, (d) How is a critical selection of sources being made in relation to research questions or learning objectives?, and (e) Where do students experience difficulties or pitfalls in the abovementioned study activities?. The analysis of the results is intended to indicate conclusions and recommendations concerning how education might be continued and improved at UB and UM. The framework of IL as skills and competences to critically and effectively access and assess academic information serves as a context for the creation, the analysis, and the conclusions and recommendations of the survey. This quick scan presents the following general findings and observations:

Sources for papers and in the PBL context. Students regularly conduct independent literature searches for their papers. However, they are more often provided with fixed literature lists for their problem-based learning (PBL) classes, which means that they often miss out on learning how to effectively search for and critically assess academic information for their class discussions.

Library catalogue and resources. The majority of students regularly use the LibSearch tool of the UM for gaining access to information resources. Approximately half of the students use the LibSearch tool for the discovery of new sources – other (general) search engines seem to also be very popular for researching (new) sources.

Frequent online sources. Google, Studydrive, and Facebook are used frequently for students' research; students refer to YouTube, online blogs, and vlogs quite regularly, as well. On the one hand, and in a negative sense, this means a reliance of students on potentially informal and unacademic sources, as well as a dependency on monopolist and economically-driven international corporations (which is questionable from a political point of view). The easy and immediate accessibility of online sources might also dampen students' awareness of the struggles and persistence research requires. On the other hand, and in a positive sense, the use of online media can also mean a broad variety of experiences in critical thinking and enrichment in students' information literacy competence repertoire by including

current and up-to-date media and technologies, a proficiency of which is necessary for future academic and non-academic professions.

Organising sources. Less than one third of all students use bibliographic management systems. EndNote is most popularly used by the students, Zotero and Mendeley less so. Additionally, many students confuse generic reference producing websites with proper bibliographic management systems; this shows that they are not aware of the comprehensive functions of bibliographic management systems. Combined with a low tendency to document search activities and the lack of organising found sources, comprehensive and reproducible thus research becomes difficult.

Sharing sources. While students mostly share resources with each other through their email accounts, also Facebook, Google Drive and Google Docs are increasingly popular – it remains to be seen how this reliance on profit-driven providers concerning potentially sensitive research data is to be evaluated.

Comparisons between faculties and study years. Since the overall and the sectional sample sizes were smaller than expected, the results of this survey are not representative or generalisable. Especially the Master's students sample was too small to make specific statements about the Masters' students' population at UM. The comparison between faculties and study years within the Bachelor's students' sample is problematic for the same reasons. Generally (and with these limitations in mind), Master's and more advanced students in the sample seem to be slightly more accustomed to and successful in their literature research than the questioned Bachelor's students and there seem to be disciplinary differences between students' experiences with different research types and intensities (while this is also implied by common sense, more research could shed light on the underlying causalities and more precise conditions). However, Bachelor's students seem to me more flexible, methodical, and communicative in and about their research and its documentation procedures, which can be seen as an adaptive and creative approach to dealing with issues.

Questionable research practices. While students resorting to questionable research (or even illegal) practices for their research cannot be desirable from an institutional research standpoint, it can be positively observed that students do not rely as heavily on sources such as Sci-Hub as might have been anticipated. Whether this means that students largely use legal manners to acquire resources might be investigated further; however – there might also have been a 'response bias' in the survey preventing us from gaining more insight into these elements of researching habits.

General information literacy competences. When examining the findings of how students access and assess academic information, some tentative conclusions about the overarching information literacy framework can be made. Based on the findings, one can conclude that there seem to be differences in degrees of IL competences between students at UM. The fact that there is only a small difference between successfully finding sources and not gaining access to required resources invites questions, however. Further research is needed to look into determining how precisely IL competences can best be measured, quantified or qualified, and assessed from an institutional (UB and UM) perspective.

Based on these findings, this report concludes with the following conceptual, methodological, and practical recommendations that provide an overview of potential future steps that might be taken to advance research on IL at UM:

Conceptual recommendations. Future research into IL competences at UM and UB could make use of and further elaborate the IL competences framework as a benchmark to evaluate students' abilities to access and assess academic information. A wider scope in researching these competences could be achieved e.g., through additionally conducting an in-depth analysis of how students apply IL competences practically within written assignments, and by asking instructors (course coordinators and

tutors) of UM to critically reflect on their impressions of and expectations for IL competences (education).

Methodological recommendations. In light of this report's findings, and in order to be fully functional to guide concrete recommendations as to how IL education can be improved, more precise data need to be collected. There are two main alternative research approaches that could be followed in the future: Firstly, one could opt for a quantitative statistical approach. This could be achieved by selecting a representative sample of participants from the respective student population(s) one would like to investigate, and by employing a more thorough statistical analysis of the data. Secondly, one could opt for a qualitative approach that is based on discourse analysis and works with in-depth analyses of interviews and the interviewees' perceptions and motivations. Both approaches could benefit from the wider research scope that is mentioned under the previous conceptual recommendations.

Practical recommendations. Effectively searching for and critically assessing information can be seen as an integral part of PBL and IL and as such might need be incentivised more from an institutional perspective: more courses might be encouraged to instruct their students to search for literature more actively in the PBL class setting. Further research could also look into how literature is assigned or being searched for within the PBL context concretely. Since there are different ways in which students might be accustomed with a critical assessment of academic information, the different options that are in practice at UM might need to be investigated in greater focus. Based on the positive (researching) experiences students can gain from working with (new) online media, such as i.a., blogs, vlogs, wikis, UM and UB could increase the scope and importance of already existing programmes and incentives to foster students' informed and critical use with such technology, as e.g., the already ongoing Wikimedia cooperation. The UM and UB could also strive for a heightened awareness of students of how to use available tools and methods to find quality academic sources and how to avoid informal and illegal channels in this process. In awareness of students' low understanding and use of bibliographic management systems, UB could consider enhancing the offering or marketing of courses on such tools to increase their popularity among students.

This survey started from the assumption that when becoming more experienced at defining and measuring IL competences among students, one can also become more aware of and skilled at teaching and conveying such skills to students: the results indeed present interesting findings and imply further paths to be taken in the investigation of IL competences at UM and their continued improvement. Future research by means of quantitative surveys or qualitative interviews might shed light on even more fruitful and successful paths for IL (education) at UM and UB.

How do students access and assess academic information?

Introduction

Being able to distinguish useful from misleading information is an important competence for students, instructors, and general citizens alike: gaining access to information means gaining access to power and ultimately to shaping the world we live in. As Ann Blair (2011) explains, information overload is not a new phenomenon, but occurs regularly in history as "a coincidence of causal factors, including existing tools, cultural or personal expectations, and changes in the quantity or quality of information to be absorbed and managed" (p. 3). So understanding and structuring information always entail challenges. This process of creating order, meaning, and purpose within the wide field of available (academic) information, and the ability to find answers to the questions one needs answered, is commonly referred to as information literacy (IL):

> Information literacy is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning.
>
> (ACRL Board, 2016, para. 7).

As defined by the Association of College & Research Libraries (ACRL) here, IL entails accessing (searching effectively and finding) and assessing (critically reflecting and evaluating) information resources for one's specific research interest. This definition also points to 'participating ethically' in academic communication, which implies discussions of copyright, plagiarism, and open access, and thereby shows how central IL concerns are in the contemporary academic world and the education of students.

In their studies, university students should not only make use of the recommended literature provided by their course coordinators and tutors but also go beyond this with their own creative research. When searching for information resources for assignments such as papers and presentations, and additional information for their classes, students also seem to increasingly rely on search engines such as Google, and encyclopaedias such as Wikipedia, social media sites, blogs, vlogs, other communities or platforms online, such as discipline- or study programme-based groups, in addition to the traditional library discovery tools. But how do students gain access to sources, and how do they assess them effectively and critically?

Unfortunately, students face obstacles in the way of achieving IL as a competence. Frank Menchaca (2012) views the underlying commercial structures of the Internet and the connected 'information economy' as problematic for giving economic incentives (rather than content-driven or non-profit-motivated incentives). Menchaca here mostly discusses Google, Amazon, and Facebook, and he worries about how students can be equipped best for living, researching, and thinking critically in today's world. He claims that "networked information is evolving to a point at which (…) – responsible education, pedagogical authority, critical thinking, democratic society – are potentially risked" (Menchaca, 2012, p. 403).

As part of a global research project on students' access to resources within their studies, Czerniewicz' (2015) study lends very strong support to these suggestions: one of the most interesting findings of her research is that from the 1001 students from law, media studies, and health sciences she surveyed, most were not even able to tell whether the resources they were using had been obtained legally or illegally. This goes along with the idea that "most students are nevertheless [i.e., despite not being formally instructed in IL competences] capable of acquiring at least some information-seeking knowledge through self-regulated learning, given that they possess a sufficiently high working memory capacity" (Rosman, Mayer, & Krampen,

2015, p. 105). When striving for a more systematic and integrated approach to preparing students for the difficulties and challenges of academic research (and also for working with information in a non-academic context), one might want to go beyond this 'make do' approach. Especially the uneven spread of these 'natural' gifts is cause for concern; as Czerniewicz (2015) stresses, some students perform much better within the seemingly random world of academic research than others, and this may lead to a structural disadvantage of some students (Czerniewicz, 2016).[1]

The concerns about students' abilities to cope successfully with the available academic information are further supported by research conducted by Jimmy Frerejean, Johan L. H. van Strien, Paul A. Kirschner, and Saskia Brand-Gruwel (2016). Through several tests involving interviews and problem solving tasks, Frerejean et al. (2016) came to the conclusion that IL competences in the students participating in their study were underdeveloped and were in need of improvement.

As an institution dedicated to facilitating effective research and fruitful education, the University Library Maastricht (UB) strives for an excellent course and tool offering. Especially concerning IL education, UB and UM strive to collaborate in developing 21st century competences to stimulate students' self-directed learning.[2] The survey discussed in this report set out to investigate in how far students of Maastricht University (UM) have the ability to critically and effectively access and assess academic information. Based on the discussion of the survey results, this report includes conceptual, methodological, and practical recommendations concerning which steps the University Library Maastricht (UB) together with UM faculties could take to further ameliorate UM students' researching abilities. This report is located within the framework of information literacy (IL), and particularly looks into whether and how students can critically and effectively access and assess academic information.

Hypotheses

This survey is based on several hypotheses, which are presented here and will be returned to in the discussion and conclusion sections of this report:

1. *Inter-individual differences*. As an institution dedicated to facilitating effective research and fruitful education, the University Library Maastricht (UB) strives for an excellent course and tool offering concerning IL. It can be assumed,[3] however, that there are differences in degrees of IL competences between students. Learning more about these differences, we will hopefully be able to design support, classes, resources, and skills courses in a way that can help all students improve their IL competences.
2. *Knowledge utilisation*. On a methodological level, it is suggested that when becoming more experienced at defining and measuring IL competences among students, one also becomes more aware of and skilled at teaching and conveying such skills to students, and this might have positive results for students' overall information skills. From our quick scan, we can hopefully draw preliminary conclusions about the state of UM students' IL competences. It is expected that there is room for improvement that can be discovered in this way, and that future initiatives can pick up some of these ideas to increase student IL competences at UM.

[1] In light of the recent open access agreement between the universities in the Netherlands and Cambridge University Press (CUP), Czerniewicz's article gains increasing relevance. Here, she claims that universities need to ensure their students' ease of access to relevant resources. However, she also discusses "piracy practices [as] part of the new order", meaning that without piracy students and researchers cannot access all the materials they need for their research (2016, p. 13). It remains to be seen how this discussion can be successfully navigated.

[2] This view is expressed in the UM's Strategic programme 2017–2021 (Academic Affairs, Marketing & Communications, 2016).

[3] See i.a., Rosman, Mayer, and Krampen (2015) and their research on the topic. Also, as indicated in the original assignment, see appendix 3, the need to investigate the IL competences of UM students indicates that there is an awareness of improvement potential.

3. *LibSearch*. On the basis of verbal reports,[4] one might assume that students do not use LibSearch as a main research tool. It seems that they resort to search engines such as Google for finding new information resources.
4. *Sharing resources*. It is expected that students find and share literature (increasingly) via social media, blogs, vlogs, or other communities or platforms online, such as discipline- or study programme-based groups. When knowing how students use the present information infrastructures, suggestions about changes and improvements can be made.
5. *Informal, questionable, and illegal resources*. Based on observations and information gained in evaluation rounds in classes, students seem to overly rely on Studydrive, Google, Sci-Hub, and academia.edu. This raises two concerns: firstly, students seem to rely on many informal and unacademic sources for their research; secondly, they seem quite readily to resort to questionable or even illegal practices for their research. Determining what students' issues are in terms of obtaining access to information resources might aid the creation of a more accessible information infrastructure for students and/or the better education of students for using already existing information infrastructures.

Traditionally, the library plays a role in providing access to scientific information. The library further offers – in close cooperation with the faculties – skills training for students on how to search and assess information. To successfully search for and find adequate information after having critically assessed one's sources is a complex competence that students work towards acquiring during their studies at university. The challenges for students as (beginning) researchers are manifold. This becomes especially apparent when considering debates on peer review, as well as confirmation and publication bias,[5] plagiarism, and other compromising circumstances surrounding (scientific) information and academic communication. In the context of several ongoing projects aimed at enhancing the quality of education at UM,[6] the present report presents a quick scan that was conducted by the University Library Maastricht on how UM-students access and assess academic information and how their IL competences could be improved further.

Methods

The survey comprises several categories of questions.[7] Firstly, the opening section consisted of demographic questions and questions about study progress. Secondly, questions about how students evaluate sources were given. Thirdly, we asked how and how often students perform literature searches during their studies, and which tools they use for these processes. Fourthly, we asked about potential issues and problems students might face when searching for academic information and how they cope with these difficulties. Fifthly, students were presented with an open-ended text answer to determine how they know when they have gathered enough information for a certain research purpose. Lastly, we asked which social media platforms students use, and also enquired whether students use bibliographic management software to help with the organisation of their research.

The survey was distributed from 3rd April 2017 until 8th May 2017. In a first round, the survey was distributed through the library's Facebook page, and was presented to students in the inner city library and at

[4] Personal communication with students in the courses "Introduction to academic skills I", "Introduction to academic skills II", "Writing in an academic context", "The Journal Project" in my capacity as their tutor at UCM, discussing and guiding their research processes (LMF, September 2015-June 2017).
[5] See i.a., Lee, Sugimoto, Zhang, and Cronin (2013) for an interesting historical as well as contemporary investigation of peer review, bias concerning publications, and the ideals of neutrality in academic communication.
[6] See e.g., the ongoing cooperation with and developments at EDLAB, Maastricht University's institute for education innovation, in several fields and projects: https://edlab.nl/innovation/
[7] See Appendix 1 for a complete overview of the survey.

Randwyck on iPads by library students.[8] In a second round, the Facebook post was renewed, as were efforts in the on-site locations. Likewise, the survey was sent to the student associations, who forwarded it to students through their mailing lists. Moreover, the survey was sent to the student project team.[9] Thus, students who were present in the library physically, follow the library on Facebook, and are actively affiliated with student associations had a higher probability of being included in the sample than other students of UM.

For the evaluative questions, the survey employed matrix questions offering the participants a 5 point Likert scale (1 = never, 5 = always; 1 = completely irrelevant, 5 = very relevant) to select an answer. The gathered data were visualised and analysed with the integrated analytical methods of qualtrics, specifically the (filtered) reports option.[10]

Results

When comparing the distribution of Bachelor's and Master's students as well as their faculty affiliation between the sample (Table 1) and the general student population (Table 2), one can make the following observations: the Bachelor's students are overrepresented, while the Master's students are underrepresented in the sample. For the Bachelor's students, the ratio of FHML students is almost equivalent to their actual UM-wide proportion. The Bachelor's students of FdR and FPN are overrepresented, while the Bachelor's students of SBE, FASoS, and FHS are somewhat underrepresented. For the Master's students, FPN is completely absent in the sample, and FHML and FdR are underrepresented. For the Master's students, SBE is strongly overrepresented, and FASoS and FHS are slightly overrepresented.

Surveyed sample		FHML	FPN	SBE	FASoS	FHS	FdR
Bachelor's	82%	23 %	19%	20%	9%	6%	23%
Master's	18%	29%	0%	36%	7%	7%	21 %

Table 1: Overview of students who participated in the survey; n = 139.

Student population		FHML	FPN	SBE	FASoS	FHS	FdR
Bachelor's	65%	25 %	10%	29%	12%	10%	14%
Master's	35%	35%	12%	20%	5%	6%	22%

Table 2: Overview of UM student population.[11]

While none of these results are representative, the surveyed Bachelor's students come closest to representing the student population.[12] Since most results are similar across faculties and study programs (including

[8] The library students at UB are students who assist students with questions, problems, and enquiries related to the library's facilities and functions; see: http://library.maastrichtuniversity.nl/meet-our-library-students/.

[9] The student project panel consists of about 70 students and provides feedback to UM and UB on university-related issues, see: https://www.maastrichtuniversity.nl/support/during-your-studies/participation/student-project-team-spt

[10] See for more details (only accessible with login-codes for qualtrics and this particular survey project): https://eu.qualtrics.com/results/?surveyId=SV_bHtmDL62ecxokwB#/surveys/SV_bHtmDL62ecxokwB/containers/59130da868befe19008efbfb/pages/Page_257151591777

[11] These (rounded) numbers are based on the overview in Appendix 2. For this calculation, the number of registered students was used (instead of the unique students, because we allowed for students to indicate several programs. The focus lay with students enrolled at UM, so partner program students (also a very small number compared to the student population) were left out.

[12] For the Bachelor's students, 29% are first year students, 40% second year students, and 31% third and higher up year students. While this is not representative statistically, it does come closer (at least more so than the results for the other sub-groups of the

Bachelor's and Master's), and as this is a quick scan only, the following results section pools the answers of all surveyed Bachelor's students. A comparison between Bachelor's and Master's students follows in the section thereafter, as well as a comparison between different faculties and study years.

General results: Bachelor's students

When looking at the attributes students use to assess the quality of sources, some interesting observations can be made (Fig. 1): the academic nature of a publication, the fitting keywords, the recency of a publication, and the references used within the text are the most important elements students consider when assessing the quality of an information resource. Author-prominence, peer review, and mission statement of the respective journal or publisher are among the lower, but still ranked as relevant, attributes. Additional options that were mentioned by the students are: the source in question being a primary source, being a source from a course reading list, being (easily) accessible via UB, and having a significant number of citations in other publications.

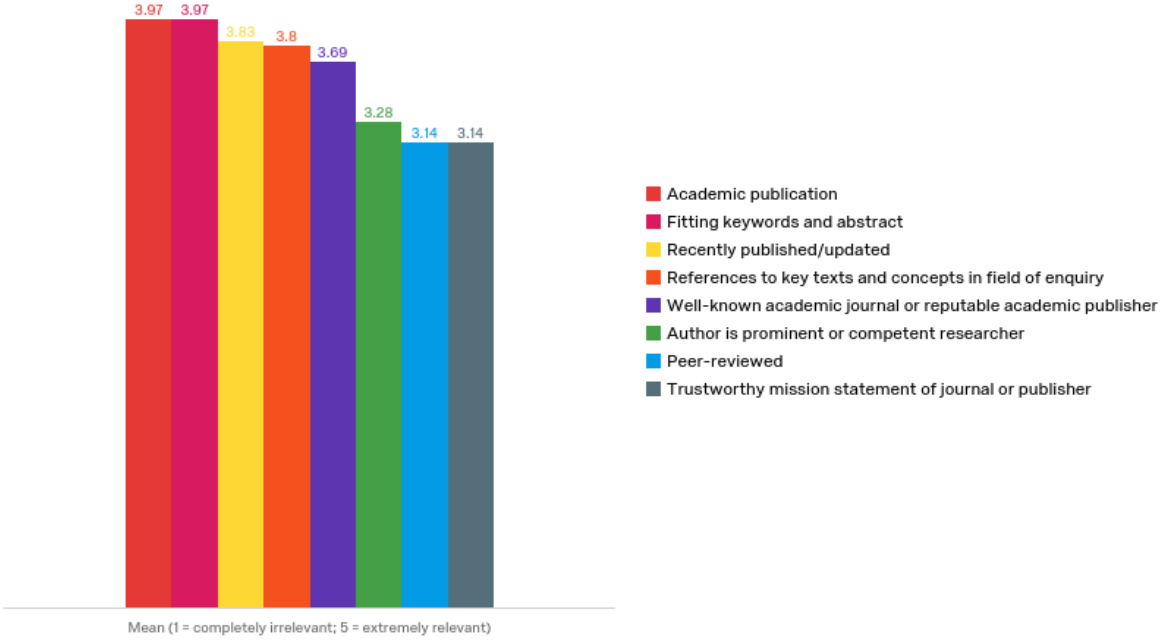

Fig. 1: UM students on the attributes they use to assess the quality of academic resources (only Bachelor's students').

The Bachelor's students surveyed indicate that they mostly use the LibSearch tool of the library (81.54%), followed by Google Scholar (69.23%), and Google's general search engine (53.85%) to gain access to information resources (Fig. 2). When using a general search engine, students seldom use an alternative to Google (7.69%). Almost half of the students refer to discipline-specific databases and 26.15% use the open shelves of the library.

UM student population) to the distribution of students and can thus be used as a general overview for UM students within this quick scan.

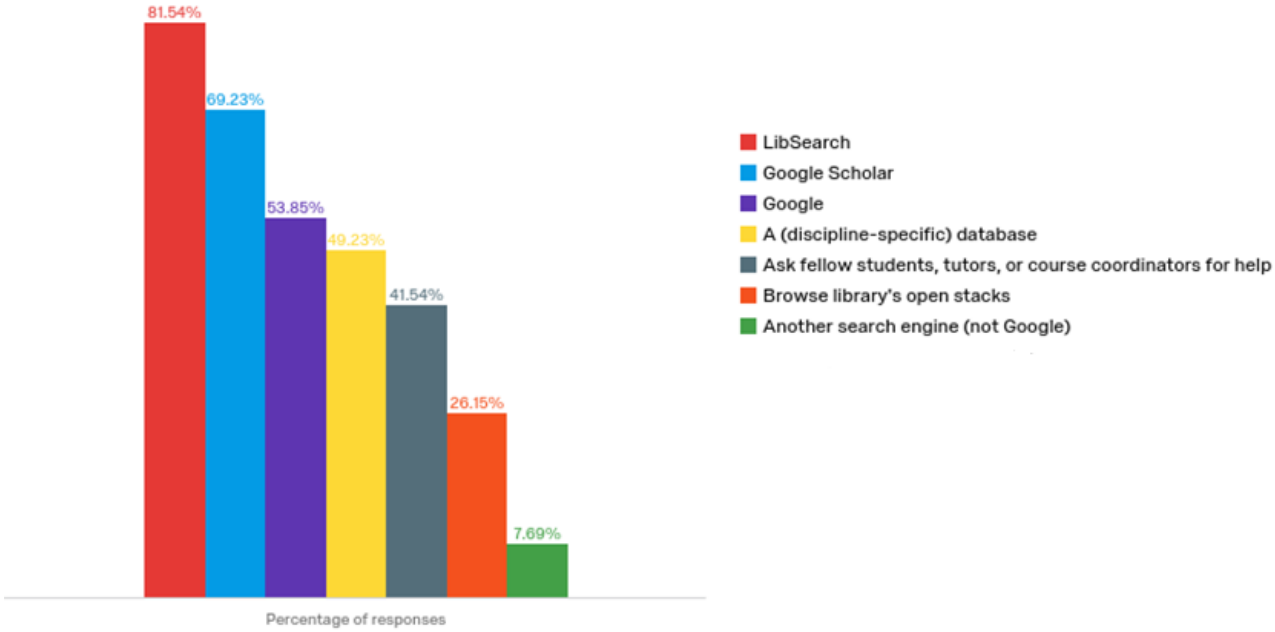

Fig. 2: UM students on the tools and strategies used to access information resources (only Bachelor's students').

The surveyed Bachelor's students indicate that they mostly use the LibSearch tool of the library to find and retrieve books from the open and closed stacks, and to gain access to already known articles. The tool is used less when it comes to finding previously unknown publications, although still half of the students use it for this purpose. The results are very similar for the Master's students.

When asked how they obtain their literature for their problem-based learning (PBL) tutorials, the Bachelor's students indicate that they mostly receive fixed literature list, and do not have to look for further sources themselves: the mean here is 4.6 out of a choice from 1 (never) to 5 (always). With a mean of 4.2, they indicate the scenario that fixed literature lists are given while students are also encouraged to find own sources additionally, and with a mean of 3.54 they indicate that they are searching for literature independently within their PBL courses.

Zooming into this some more, when asked how Bachelor's students gain the actual access to the respective literature for their PBL classes, there seems to be a more or less equal divide in (a) students having to find or copy resources based on the information provided in literature lists and (b) students being able to directly download the required sources without investing in any active searching behaviour. When asked to comment on these types of access, students commented that being handed the literature directly instead of having to look the articles up saves time and is therefore preferable.

In Fig. 3, one can see that overall and with a mean of 3.91, students are successful in gaining access to the sources they need. Also, most students are aware that the library is providing the access for them. However, with a mean of almost 3 (2.92), students indicate that they do not have access to their respectively required sources because the library does not have access.

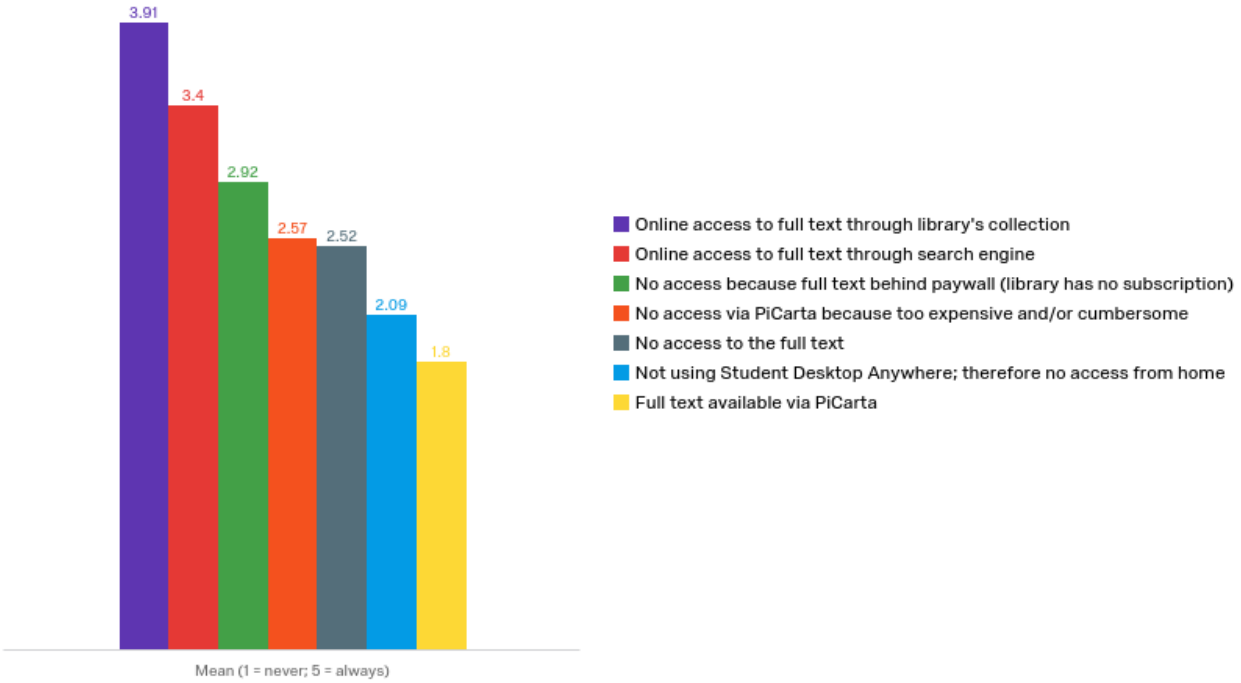

Fig. 3: UM students on different scenarios they encounter when trying to gain access to resources (only Bachelor's students').

When it comes to paper writing and the manner in which students are assigned literature or have to look for it themselves, for Bachelor's students, the most common situation is that the topic is assigned but the literature itself needs to be found by the student independently (mean of 3.48 (out of 5) for all Bachelor's students). This is closely followed by students choosing their own topic and the corresponding literature (mean of 3.42). Fixed topics and predetermined literature lists are less common and occur with a mean of 2.48.

Concerning the open-ended text question: 'How do you determine when you have gathered enough resources for an assignment?', the Bachelor's students give a range of replies. Focussing on the more assertive answers, the main claims can be summarised as: covering all keywords, reaching the fixed (minimum; 10-20) amount of resources for the assignment (and making 'it look' fully/completely researched), being able to draw complete conclusions, finding an answer to all questions set up in the paper, giving the paper a trustworthy feel, and ensuring that information is comparable when comparing different (independent) sources. Points that are further added by students are that the approval of the advisors is important, as is the recognition that all the opinions voiced can be related to one another, being able to back up all of these ideas with sources, and not being startled or challenged by new ideas. Some students, who are uncertain how to answer this question more clearly, refer to concepts such as 'intuition', the feeling of 'confidence', not knowing when to stop, and at one point in time just stopping anyway because the deadline is approaching, or when the word count has been reached.

Comparison: Bachelor's and Master's students

Among the surveyed Bachelor's students, 38% perform a literature search every week, whereas 62% perform a literature review less often. Among the Master's students, these numbers are reversed with 64% performing literature reviews every week, and 36% performing literature searches less often. One can also see some differences in how successful the students are in gaining access to information resources: overall, the Master's students seem to be slightly more successful at gaining access than the Bachelor's students (with a difference of 0.3-0.8 (out of five) in the mean values).

Concerning how students deal with complications in their research process (Fig. 4), 64.62% of the Bachelor's students enter their main search terms into a search engine to find resources when at a loss which resources to work with, but merely 28.57% of the Master's students opt for this solution (Fig. 5). Further, the Bachelor's students are slightly more likely to ask the library staff for help than the Master's students. Also, the Bachelor's students turn to their peers for help more (73.85%) than the Master's students (50%). PeerPoint is consulted by 6.15% of the Bachelor's students and 7.14% of Master's students. Potential faculty Writing Centres are visited by 4.62% of Bachelor's students, and none of the Master's students in this survey make use of Writing Centres.

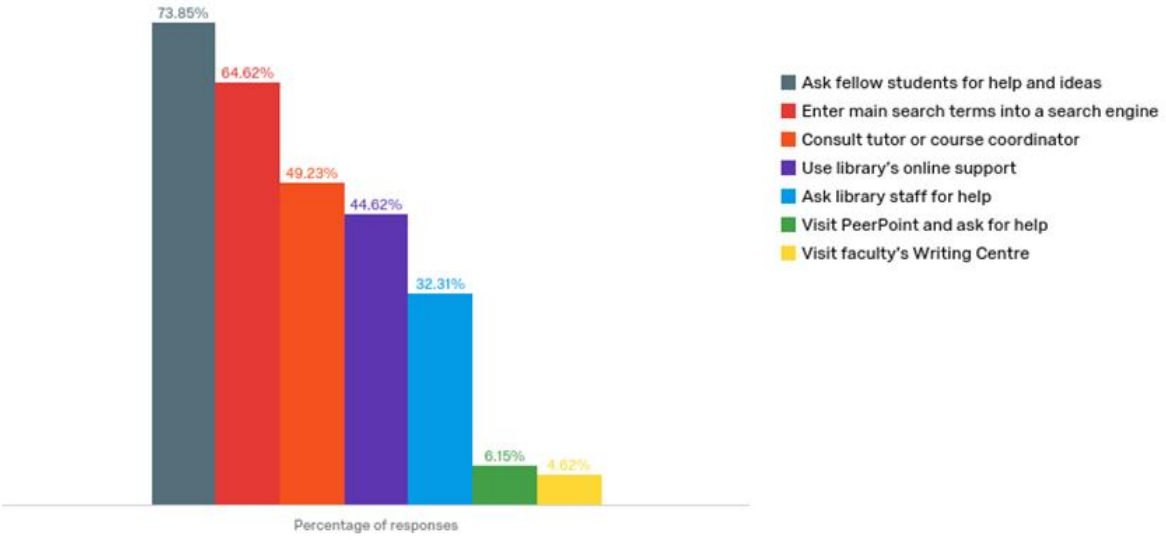

Fig. 4: UM students on how to seek help when struggling with finding useful resources (only Bachelor's students').

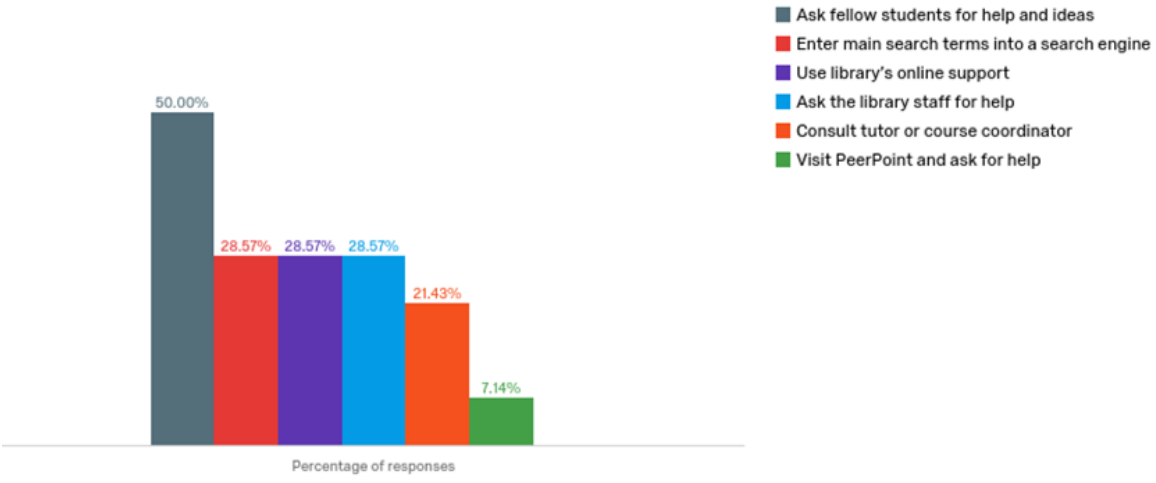

Fig. 5: UM students on how to seek help when struggling with finding useful resources (only Master's students').

When independently searching for information resources, the Bachelor's students mostly neither work with completely fixed search terms (or keywords) nor in a completely 'randomised' fashion; 73.85% of the Bachelor's students seem to stick to some general search terms while modifying these on the go to fit the new ideas they come across (Fig. 6). In comparison to the Master's students (Fig. 7), the Bachelor's students comparatively document their search strategy more often (39% for the Bachelor's students vs. 21 % for the Master's students). 50% of the Master's students decide upon their search terms before beginning with the search itself and then also stick to these without modification, while only 31% of Bachelor's students choose this approach.

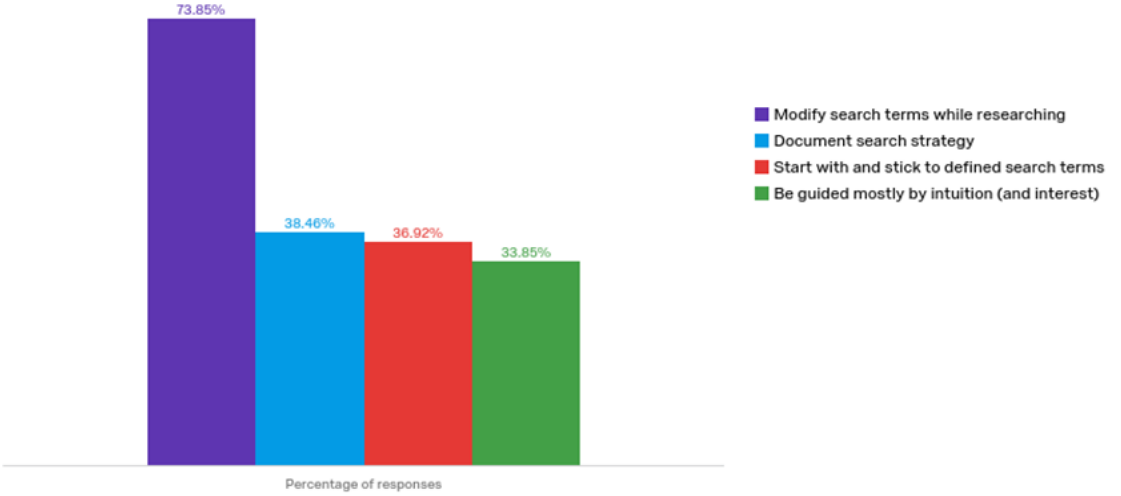

Fig. 6: UM students on how to search for information when no literature list is given (only Bachelor's students').

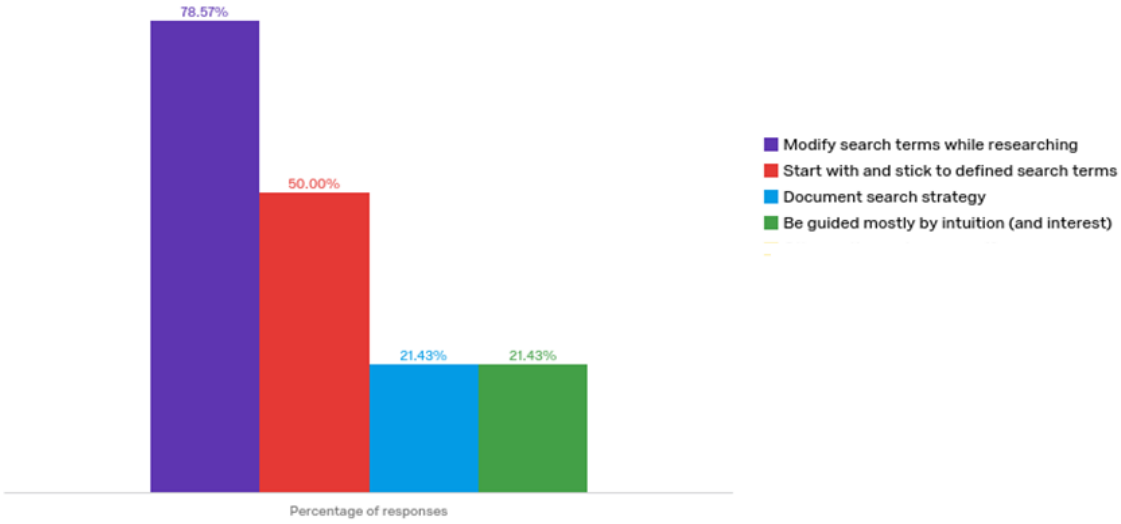

Fig. 7: UM students on how to search for information when no literature list is given (only Master's students').

When turning to social media usage, for the Bachelor's students it can be observed that Studydrive (mean of 4.13), Facebook (mean of 3.6 for messages, and mean of 3.52 for groups), and YouTube (mean of 3.48) are the most popular source for information resources (Fig. 8). For the Master's students, Facebook (mean of 3.29 for messages, and mean of 3.43 for groups) and Studydrive (mean of 2.57) are most important; for the Master's students, academia.edu, YouTube, and Sci-Hub, are roughly on the same level with means between 2.43-2.57. In this context, all students report relying mainly on Facebook groups that were created specifically for university-related topics and discussions. For Youtube, the Bachelor's and Master's students mentioned the following specific channels and information providers: ACDCecon, BBC documentaries, Khan Academy, and Armando Hasudungan. Students indicate that they further use the following (social) media websites to keep informed and to gain access to information: Medscape,[13] UpToDate,[14] NGO or governmental sites, Dropbox, and Bookzz.org.

[13] See: http://www.medscape.com
[14] See: http://www.uptodate.com/contents/search (which is also part of UB's database collection but apparently not known to students in this context). Also relevant here is: http://browzine.com/

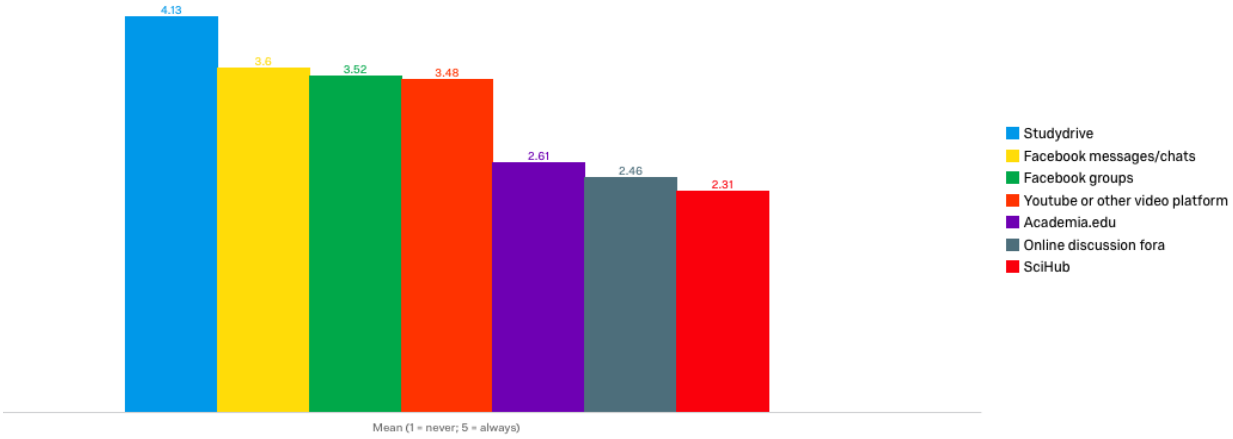

Fig. 8: UM students on their usage of social media platforms for gaining access to resources (only Bachelor's students').

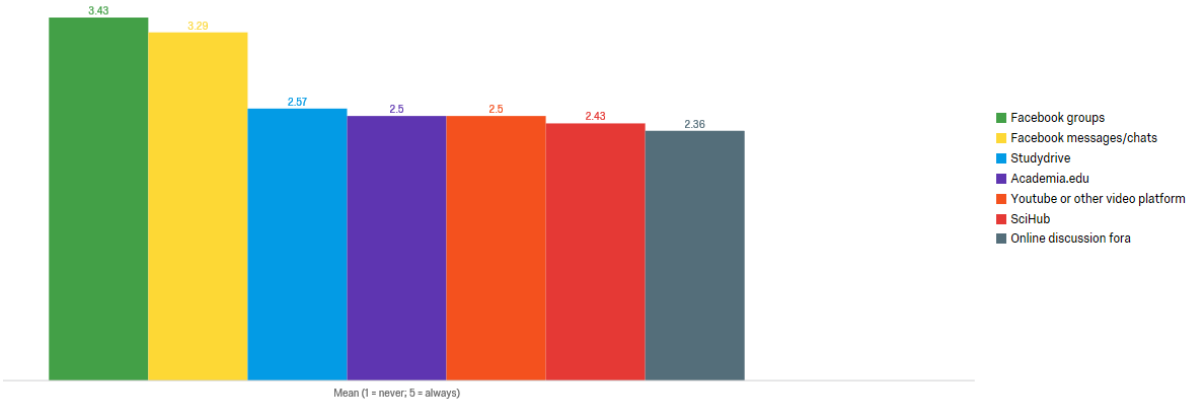

Fig. 9: UM students on their usage of social media platforms for gaining access to resources (only Master's students').

The Master's students rely less on Studydrive than the Bachelor's students and seem to have slightly more familiarity with Sci-Hub than the Bachelor students. All students share resources with each other quite frequently and use their email accounts and Facebook accounts equally often (mean of 3.54). Students also indicate as additional points that they use Google Drive and Google Docs.

Staying with software that students employ in the writing process, students report the following information on bibliographic management software: of the Bachelor's students, 30.77% use such software, and of the Master's students, 26.57% use it. The Bachelor's students mostly use EndNote (55%), but also use the inbuilt referencing function of their word processing programs, and to a lesser extent alternative bibliographic management software such as Mendeley (20%) and Zotero (10%). The Bachelor's students also use generic online tools to create the references for them and then manually import them into the document. While these are not actually bibliographic management software, students perceive them as such and also referred to them frequently in the survey. The results were quite similar for the Master's students except that they do not use Mendeley or Zotero at all, and solely rely on EndNote, the word processing programs' inbuilt referencing functions, and online reference generators.

Comparison: students of different faculties and years

Similarly to comparing Bachelor's and Master's students, comparing some of the faculties and the different years within the programs might yield interesting results. When merely looking at the largest faculties represented in the sample however, almost half of the first year students are from the FdR (47%), almost one third of second year students are from FPN (31%), and almost half of the third year students and above are from FHML (45%). The other student populations seem too small to be considered meaningful in their implications. This makes it impossible to compare the faculties or the study years, because each can be a confounding variable for each other: comparing students from different years from different faculties would mix several potential influential circumstances. This means that, with the current results, at best some observations about first year FdR students, second year FPN students, and third or higher up year FHML students could be made. Table 3 shows the different frequencies with which students perform literature searches in their studies:

Performing literature searches	1st year FdR	2nd year FPN	3rd+ year FHML
Every week	33%	50%	78%
once or twice per month	22%	38%	11%
once or twice per semester	44%	12%	11%

Table 3: Overview of frequency of literature reviews (faculty and study year filter).

Discussion

Based on the student population of UM, 16608 students,[15] the sample size we aimed for with this survey was 376 students.[16] Unfortunately, we only managed to obtain 139 completed surveys as basis for this quick scan, so the generalisability of these findings is limited. Further, when making comparisons between groups within the sample, one needs to take this into account concerning sample size, as well, and ensure that for each sub-group of the sample, the size and selection of participants is adequate. Seeing as our low number of respondents prevents us from taking this into consideration, the potential margin of error for the present findings is high.[17] The number of sampled Master's students, is not proportional to the number of students enrolled in UM Master's programmes. Moreover, the distribution of participants across faculties is not in accordance with the global proportions at UM. The results discussed in this quick scan are thus not representative or statistically significant, but they present a starting point for tentative observations and potential further research some.

Since this report investigates IL competences of UM students, the act of performing literature searches is to be seen as a central point of interest: when students are asked to search for literature, they need to be able to rely on IL competences to make smart research choices. The application of IL competences at UM seems generally successful, which seems to be in accordance with Rosman et al.'s (2015) findings that most students (somehow) manage to cope with the difficulties of managing research – with or without successful

[15] This number of students was arrived at by focussing on the total number of registered students at the UM in 2016, who are registered mainly at the UM (and who are not from partner programs); see Appendix 2 for details.
[16] This sample size was calculated using the online tool of qualtrics with a standard configuration of a 95% confidence level and a 5% margin of error and based on the student population information to be found in Appendix 2, see: https://www.qualtrics.com/blog/calculating-sample-size/.
[17] In order to make generalisable claims about all students at the university, the situation must be given that all students have the same probability of being asked in the survey. For this quick scan, we could not ensure this.

IL skills trainings. The fact that there is only a difference of roughly one point in the means from successfully finding sources (mean of 3.91) and not gaining access to required resources (mean of 2.92) invites further questions (see Fig. 3).

Why are students experiencing these different scenarios? Are the articles they need really not accessible to them this often or do they make mistakes in using and applying the respective tools? Further research is needed to look into this question, and also into determining how precisely IL competences can best be measured, quantified or qualified, and assessed from an institutional (UB/UM) perspective. This becomes particularly evident when regarding the present findings on how students assess the extent and completeness of their own research can be made: while the question might have been clarified more,[18] the students' replies indicate rather vague, personal, and even random-seeming criteria to evaluate when enough sources for a given assignment have been found and consulted.

Overall, the students are performing literature searches more often than we might have anticipated: most of them search for literature once per week, with the Master's students performing literature searches more often (see Table 3) and slightly more successfully than Bachelor's students (in terms of finding the resources they were looking for).[19] This difference seems obvious, since Master's students usually conduct more (independent) research than Bachelor's students, who first need to learn more basic rules and methods of the respective discipline they are becoming acquainted with. And while one might look into the underlying reasons of this further, these results are rather obvious: it seems likely that advanced students (in their Master's programs or higher study years) can perform self-independent literature research more easily and successfully than beginners.[20] Also when comparing Bachelor's and Master's students concerning how they come up with their paper topics and literature used to investigate these topics, one needs to consider the great differences between faculties and the writing assignments students might face: e.g., in law, there might be several students analysing the same case and the same literature; in other faculties and programmes there might be assignments where students may come up with different directions for the answer and supporting literature.

Seeing as Master's students perform literature searches more often than Bachelor's students, one could also expect them to be more experienced. So, it seems fitting that when asked how to cope with struggles in their research, 64.62% of the Bachelor's students indicate that they enter the search terms into a (general) search engine (again), whereas only 28.57% of Master's students give this answer: it might be the case that the question was phrased misleadingly, but the intention was to find out how students react when they have already tried basic research methods and are still struggling. The mere repetition of the same behaviour as before, as indicated by the second most frequent Bachelor's students' answer, is interesting and indicates a potential inability to think of new solutions.

However, Bachelor's students seem to be more flexible and methodical in their creation and documentation of the search terms they use for their literature searches (Fig. 6 and Fig. 7). Also, Bachelor's students seem to be more proactive in social terms by consulting each other and the library staff more openly when struggling to find sources: likewise, their first impetus is to consult other students for help and ideas, and this indicates creative problem-solving skills. Interestingly, (Bachelor's students') peers are turned to mostly for help (73.85%), before all other official help channels, such as tutors, library staff, PeerPoint, or Writing Centres. Master's students turn to their peers less (50%), they ask their tutors or the library staff for help more seldom (both 28.57%), and they sometimes visit PeerPoint or Writing Centres. These findings

[18] See Appendix 1, question 24: e.g., how is 'enough' defined?

[19] The results we have gathered are neither representative for the study year students are in nor for their faculties: there might be differences in disciplines as well as duration of the study that influence the different frequency of literature searches between the students that took part in the survey. Further research could look into this in greater detail to gather more specific and comparable results.

[20] Similarly, the differences to be seen in Table 3, the different intensities and frequencies of literature researches between different faculties and study years, can be explained by different disciplinary and study-advance positions.

might be due to the imbalance of the present student sample. However, it might also be the case that Master's students at UM approach research in a more solitary manner than Bachelor's students; and perhaps not all students are aware of the help services offered to them.

For their papers, students engage in independent research fairly often and intensively: most students can freely choose topics and/or references, or at least one of these, which helps them to learn to take investigative responsibility and develop their own critical and creative ideas. Of course, one also needs to consider different disciplinary constraints here that might make it necessary for students in the undergraduate level to become familiar with certain core sources or research methods, which might make fixed topics and/or predetermined reference lists for certain (written) assignments necessary.

When it comes to their PBL classes, Bachelor's students mostly receive fixed and recommended reading lists (mean of 4.6), but they are also asked to find additional readings (mean of 4.2), and sometimes even all of the readings, themselves (mean of 3.54). Thus, students are learning how to look for sources, on the one hand: some students are quite practiced in searching for literature for their PBL problems and tasks. But by not having to find sources for the PBL classes regularly and consistently, not all students receive this helpful challenge: some students might not be prompted enough to actively search for resources that pertain to problems and questions discussed in class. This can be seen as a problem within the PBL environment; ideally, this environment is meant to foster active and critical student engagement with information resources (Van Til & Van der Heijden, 2010, p. 10). Further, the expressed view that having to find, download, print, or copy sources is a 'waste of time' for students, indicates that students are not always aware of the positive learning effects that independent research can have for them and their academic competences.

So, while for their paper research students learn more active researching skills, within the PBL context the students' own research might be more incentivised. Students flourish when they are being challenged to exert their competences (Van Til & Van der Heijden, 2010) – therefore, by giving students fewer fixed readings lists and by making the search for literature a more integral part of the regular PBL sessions in the future, students could perhaps be encouraged more to develop creative and critical approaches when faced with complex questions.[21] This would also entail adapted approaches to teaching, guiding, and assessing students within their classes.

To get a better impression of how strongly developed IL skills currently are among UM students, we need to look at how students assess the sources they find in their literature searches. One can summarise that students seem to be aware of the main attributes of proper academic research sources (as indicated in Fig. 1), or rather, that they report on these attributes in a manner that is consistent with common conceptualisations of academic sources. The fact that some elements are rated less important, as e.g., peer review, might be interesting. Does this mean that students are actively reflecting on the relative importance of these attributes, though? The differences between the means are so small that it is difficult to conclude exactly where the students' strengths and weaknesses in their source assessment lie.

Looking at how students gain access to information resources, it is positive to note that LibSearch is their most used tool. Even though students' verbal reports indicate otherwise, this shows how much students value UB's curating expertise and also how usable the tool is. However, the less frequent use of the LibSearch tool to find *new* information indicates that the tool might not seem to be perceived as handy for conducting research into yet unknown sources as it might be or as other available tools are perceived – this might be an incentive for the library to adapt their offering more towards the quicker and easier discovery of new information. The fact that students report more negatively about the LibSearch tool than they indicate in this survey also points to the criticism of the tool as a potential venting mechanism for frustrations with the research process itself. It remains difficult to separate these different potential motivations for students' replies and views at this point and with the current findings.

[21] EDLAB is also conducting research into the implementation of PBL at the moment, see: https://edlab.nl/innovation/theme-I-instructional-design/

The heavy reliance on Google and Google Scholar, in comparison to discipline-specific databases and the library's (open) stacks, might be seen as slightly worrisome. Pointing into this direction of an undervaluing of the LibSearch tool by students is that their aggregate use of Google scholar and Google exceeds their use of the LibSearch tool. This heavy reliance on Google is also problematic considering the previous critique of Menchaca (2012): seeing as students almost exclusively use Google and other search engines only figure marginally in their searches, this gives Google a monopolist control of academic developments from a commercial and profit-driven angle. While students mostly share resources with each other through their email accounts, [22] also Facebook, Google Drive and Google Docs are increasingly popular – it remains to be seen how this reliance on profit-driven providers concerning potentially sensitive research data is to be evaluated. The easy and immediate accessibility of online sources might also dampen students' awareness of the struggles and persistence research requires.

In this context, it is interesting to consider the University of Utrecht's (UU) use of Google Scholar as a general search engine university-wide. On the library's website, students are instructed on how to use Google Scholar for academic searches to counter the frequent and uninformed usage of general search engines in student's researching processes (Universiteit Utrecht [UU], 2017a). Students are here also instructed on how to use filters to optimise their search results and to find the resources they are looking for (UU, 2017a). While there might be dangers to promoting commercially-driven, monopolising (and not academically and research motivated) search engines for students (Menchaca, 2012),[23] this also shows an interesting dimension of awareness of how students conduct their research. The UU's website further instructs students how to best create, combine, and catalogue search terms to ensure a systematic and comprehensive literature search (2017b). This step of the UU can be seen as an interesting step towards tackling the challenges of contemporary IL competences: during and after their studies, students will often be confronted with (general) search engines, and developing tools and strategies to cope with this successfully seems to be an important element of their learning experience.

Studydrive[24] and Facebook seem to be very popular among the Bachelor's students for gaining access to resources, while Studydrive is less popular among the Master's student and Facebook is similarly popular (see Fig. 8 and Fig. 9). The surveyed students do not seem to use Sci-Hub[25] as much as might have been anticipated. It remains unclear how much students really rely on questionable or even illegal sources for their research. Further research could look into this more closely and also try to establish whether the findings of this survey are accurate or potentially influences by a response bias. The Master's students, who might be further advanced in their research and also less interested in sharing lecture notes and exam preparation materials (for which Studydrive is generally seen as the preferred tool – although it could also be investigated further for which purposes students use the platform exactly), use Sci-Hub slightly more often than the Bachelor's students. Bachelor's students who are struggling with more basic elements of their courses seem to be less interested in gaining access to academic communication outside of their university library's access. It might also be interesting to look into the resources students gain from Sci-Hub and whether these are really not attainable in a legal manner. Also, while students are aware of some legal ways to find open access and

[22] It might be interesting to know whether students use their university or private email accounts for this, but we did not ask this, so we cannot know at this point in time.

[23] In this context, one also needs to consider Matthew Hindman's (2008) *The myth of digital democracy* and Eli Pariser's (2012) *The filter bubble: what the internet is hiding from you:* with their publications, these authors carve out how much the equality and openness of access is a myth in contemporary online searching practices. By using search engines and being guided by these new gate keepers to knowledge (users are only allegedly free from gate keepers while the control of search engines and their affiliated firms is merely replacing publishers and libraries in the latters' previous gate keeping positions), users of the internet only access a fraction of the available information resources. Of course, also the library catalogue creates a 'bubble' – albeit a bubble created by subject librarians and topic specialists. It remains a problematic and difficult question how students should best be prepared to cope with such circumstances, but simply making Google the default search engine for the library seems to have limitations – just as excluding search engines from information literacy education would have.

[24] See https://www.studydrive.net/

[25] See https://sci-hub.cc/

free materials, this knowledge does not seem to be very widespread, yet. Tools such as e.g., Unpaywall are not very well known, yet.[26]

Further, websites such as YouTube, academia.edu, and other online discussion fora are being used by students to access and assess information. Their use of blogs, vlogs, and other social media channels for accessing, assessing, and sharing sources might not be the most important or wide-spread manner of research of UM students, yet. However, as the results of this survey show, students are regularly using these types of media: to gain preliminary understandings of study materials, but also to find explanations and help with questions they are struggling with (in relation to their regular study materials). And as Duncan Green (2015) argues, universities should take blogging and social media-connected academic communication (more) seriously. An active blogger himself, Green stresses the value of quick online communication and the critical thinking competences that can be nurtured by discussing online (research) contributions both online and offline. For Green, "[r]eading a blog should be like listening to [a] person talk, but with links" (2015, para. 15). By engaging with online sources, students can train their abilities to question and research statements made. Through the provided links and comments sections, they also have the tools to do this effectively. More institutional guidelines in how this might be accomplished could improve this critical engagement even further: And as Green stresses, there are more reasons to favour vlogging and blogging in an academic context: the more accessible and attractive online presence of academic authors and their ideas through blogs, vlogs, and other sites generates more traffic to traditional journals and publishers and as such helps students to find respective academic research materials.

One such approach that already exists at UM is active creation of content for Wikimedia projects, as e.g. under the guidance of Vivian van Saaze and Odin Essers as part of the FASoS course "Sharing cultures". This example also touches upon a previously unmentioned source of information. Since students are mostly not encouraged to use Wikipedia as a source by their university instructors, it might not be surprising that it is not mentioned in the findings (however, this might also be connected to a response bias – prompted by us not mentioning Wikipedia in the options from which to select; this could be further investigated). In some contexts, however, students might be pointed towards Wikipedia as a starting point for research, especially concerning the references it provides.

Less than one third of all students use bibliographic management systems. When it comes to organising sources with the help of such tools, EndNote is quite popular with the students, Zotero and Mendeley are less so. Slightly worrying is the high reliance on generic reference producing websites and in-built citation software in word processing programmes for their limited possibilities. Students do not seem to see the incentives of bibliographic management systems. And they also do not seem to be able to tell the difference between bibliographic management systems and mere reference generating tools that do not offer any of the curative or organisational properties that bibliographic management systems have in store. This is problematic since combined with a low tendency to document search activities, the lack of organising found sources, comprehensive and reproducible research becomes rather difficult. Even though there are already extensive courses offered to help students understand and utilise the values of bibliographic management tools, either the offering or marketing of these tools might need to be enhanced to achieve better results and to allow the students to approach their research more successfully from an organisational perspective.

Based on the findings of this quick scan, more concrete research questions should be created to look into IL competences among UM students more in-depth in the future. The following sections look into how the present research can be continued conceptually, methodologically, and practically.

[26] See http://unpaywall.org

Conceptual recommendations

The model of 'information problem solving' by Frerejean et al. (2016) (Fig. 10) interestingly highlights how IL can be conceptualised as a process of active problem-solving behaviour. This might be fruitful as an approach for further research into IL competences at UM: the faculties and the library alike might benefit from understanding IL in terms of problem solving and also its deep connections to PBL as an educational system that emphasises students' problem solving competences. Frerejean at al. (2016) zoom into the different components of IL with their visualisation of the skill 'information problem solving': According to Frerejean et al. (2016), it is important that students are able to implement each of these steps in an independent and secure manner to further their own critical and active command of the respective information resources and thereby "solve an information problem" (p. 91).

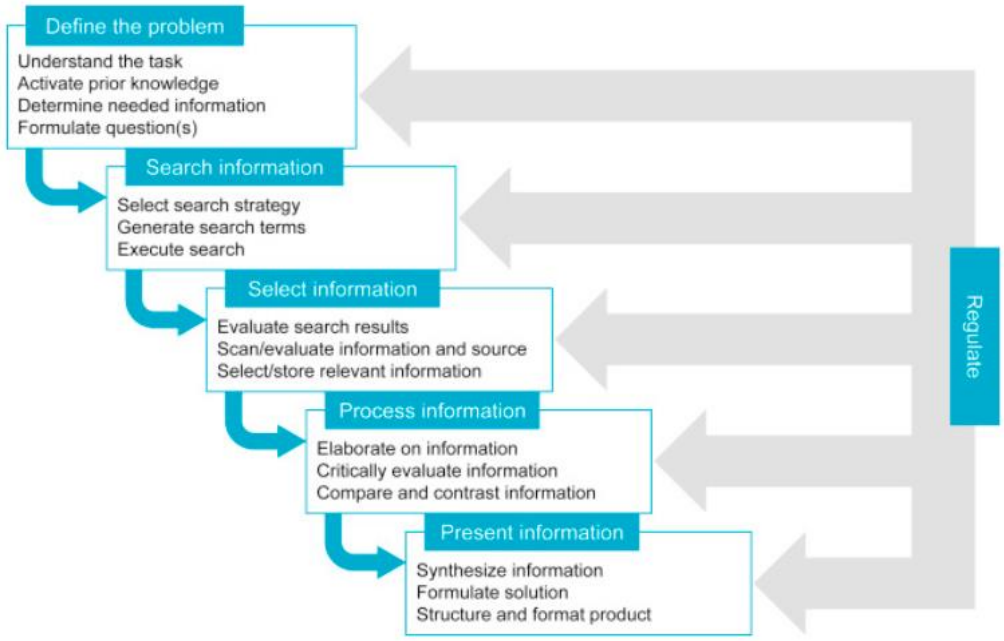

Fig. 10: Decomposition of the skill 'information problem solving' (Frerejean et al., 2016, p. 91).

For some questions in the present survey, the way the question was asked does not allow for such a deep(er) insight into what motivated the students to give their specific answer and into what their underlying reasons might be.[27] The different steps of IL as conceptualised by Frerejean et al. (2016) might be a guideline for future formulations and conceptualisations.

Another approach to investigating IL more systematically is brought forward by Tom Rosman, Anne-Kathrin Mayer, and Günter Krampen (2015) in their application of a 'situational judgment test' for IL in practice. In referencing Kathleen Dunn (2002), Rosman et al. (2015) claim that standardised multiple choice tests cannot be used to assess in how far students can practically apply the respective IL competences. Rather, students should be given a test that allows the assessors to evaluate in how far students master declarative, "factual knowledge ('knowing what')" (Rosman et al., 2015, p. 1) and procedural knowledge, "how to solve certain problems ('knowing how')" (Rosman et al., 2015, p. 1). The students are prompted with real life research situations and occurring questions and issues and then need to decide how to best proceed. Focussing on psychology students, the researchers present the Procedural Information-seeking Knowledge Evaluation – Psychology version test (PIKE-P); however, in their article they encourage the use of the test for

[27] See e.g. question 8 or question 24 in Appendix 1.

other disciplines and academic contexts, as well (Rosman et al., 2015) – as such, the test might be adapted to fit the context of IL assessment at UM.

Hence, one might also consider conducting a more in-depth analysis of students applying IL competences within written assignments. While it might be difficult to infer IL from a short survey as was conducted for this quick scan, an in-depth analysis of students' application of the competences might lead to more concrete insights. This investigation might be aided by research performed into creating rubrics to assess graduate IL skills in students (Turbow & Evener, 2016). This process could also be aided by including more practical components in future surveys, where students can *demonstrate* their actual IL competences with examples, e.g., by working on a research task or documenting their search history for a given question, and by explaining and motivating why they include or exclude certain elements.[28]

The authors further highlight the advantage of curriculum-embedded skills trainings over (external) library skills trainings when it comes to IL (Rosman, Mayer, & Krampen, 2016). This idea does not only go hand in hand with the aforementioned recommendation of testing practical research examples in the follow-up survey, but is also a recommendation for future library IL education: by tying IL skills courses into students' ongoing courses (also referred to as 'embedded librarianship'), IL competences among UM students might improve quite drastically (Rosman et al., 2016); this renewed focus on embedded librarianship in IL education in cooperation with the faculties and course coordinators might thus be a desirable goal to be implemented at UM. Also Frerejean et al. (2016) call for an integrated and continuous teaching and testing of IL competences to ensure that students are indeed well prepared for their future research and work.[29]

While the present survey is an attempt to probe into social media use of students concerning research and information access, the finding remain quite superficial and need to be deepened to create deeper insights into the importance of modern media on students' development of IL competences. A few questions in the present survey group together incomparable situations, and the questions overall could be made less generic and superficial to allow for a deeper analysis of what motivates the students to make certain choices. For instance, one can summarise that students do not seem to find peer review particularly important but seem to be aware of it at least: however, what does this tell us about how students really feel about peer review? Are they critical or just oblivious? For this to be investigated more deeply it might be useful to determine the gaps in how students are introduced to peer review and how they can come to better understand it. As an inspiration, Frerejean et al. (2016) delve into the question of how systematic students research and also how they document their search strategy exactly (Frerejean et al. ask several in-depth questions (p. 99) where we only have one single question).

Also, further research could also look into how the fixed literature lists are implemented concretely: do students have to read all the sources given or do they have to make an informed selection of a vast number of sources? Since there are different ways in which students might be accustomed with a critical assessment of academic information, the different options that are in practice at UM might need to be investigated in greater focus. This would enable us to evaluate this element of the IL education in a more detailed and precise manner and also provides the opportunity for more meaningful recommendations.

Likewise, in order to make more meaningful comparisons between the Bachelor's and the Master's students, and especially also within the Master's students, a question should be added on whether the Master's student is following a 1-year Master's or a 2-year (Research) MA. Without this information, it is difficult to make comparisons between the groups.

[28] Although having been updated last in 2014, the following compilation of IL surveys might present an interesting starting point for further research and the creation of such more practically applied surveys: http://jfmueller.faculty.noctrl.edu/infolitassessments.htm

[29] Frerejean et al. (2016) discuss the increase in students' information problem solving competences that can come from a one-time online intervention training session, but they also highlight how a "scaled-up version with more content, more task classes containing tasks of increasing complexity, offered over a longer period of time and embedded in a multitude of contexts, might prove very effective" (p. 101).

One could also aim at surveying instructors to determine their impressions of and ideas about IL competences. This might also enable researching IL across the curriculum of the different faculties of UM and to determine where the connection points are between different conceptions of IL. Alternatively, one could try to make the follow up investigation more geared towards the student and learner's perspective to complement the focus on the library instructors that there is in this survey now: this is something for further research within the project. Rather than start from a predetermined vision of which elements of IL competences students should show in their research and studying, one could aim at investigating how students experience their studies from an IL perspective and what they wish for and would like to see as improvements.

Methodological recommendations

For future research, one could choose between two different types of approaches. Firstly, a quantitative empirical (and statistical) approach to conducting research in the field of students' knowledge of IL rests on reproducible, generalisable, and descriptive approaches within the established context of the scientific method. This approach allows the researcher to get a good idea of the overall student population's ideas on the topic through a representative sample. Secondly, a qualitative empirical approach might lead to potentially more in-depth outcomes concerning the discourse surrounding information literacy at the UM; however, this approach requires more time and effort per interviewee, greater theoretical immersion in the analysis, and partly also questionable moves of creative inference and assumptions to make sense of and interpret the gathered data (see Talja, 1999).[30]

When working within a quantitative empirical approach, and to get a representative impression of student's IL competences, all students of UM should have the same probability of ending up in the sample, whether they study at home or at the library, and irrespective of their faculty membership or affiliation with student associations. To increase the reliability of the findings, one can also opt for reverse wording of questions, i.e., asking (crucial) questions twice, in a positive and a negative manner; if the results for the same question phrased in two different manners are contradicting, then this is an indication of either a methodological issue or a situation that could be the interesting subject of such an in-depth discourse analysis.[31]

In her proposal of a qualitative empirical approach, Sanna Talja (1999) might disagree with this idea, though: in her article on discourse analysis as a method specifically for investigations within libraries (also concerning IL), she outlines that contradictions in interviewees' statements do not represent "errors" within the methodological setup or execution of a particular study (p. 465). For her, and for other discourse analysts, "inconsistencies in participants' accounts are interpreted as differences between relatively internally consistent interpretative repertoires" (Talja, 1999, p. 467). Talja argues for a research approach that embraces such contradictions as attempts of the interviewees trying to make sense of conflicting ideas and conceptions. While her critique of 'traditional' research methods is partly misguided and somewhat one-dimensional, she does outline interestingly the tensions that exist between social-scientific research that sits on the difficult fault-line of qualitative and quantitative research. While there are many different ways in which researchers can call their work 'representative' or 'generalisable', especially in the context of surveys such as this it is important to evaluate such claims cautiously.

[30] As this survey was a quick scan, there was no need for extensive coding of the answers received for the open-ended text questions. However, this might be an idea for the follow-up investigation: especially if that survey will also look into more in-depth qualitative interviews.

[31] The qualtrics survey creation guidelines support this approach as a method to check whether findings are consistent and not just random outliers: see https://www.qualtrics.com/blog/online-survey-valid-responses/

For this particular quick scan, we deliberately chose a five point Likert scale in order to reduce drop out, to keep the completion time of the survey under 15 minutes, and to minimise disgruntlement should a second, more in-depth, survey should follow shortly. The fact that seven or nine point Likert scales provide more precise and differentiated results was outweighed by the need to obtain a maximum number of completed questionnaires. For such short surveys, three or five point Likert scales are recommended "to prevent the respondents from becoming frustrated and demotivated" (Preston & Colman, 2000, p. 11). The choice for a five point Likert scale could be reconsidered for a more extensive follow-up survey, however: the small differences between the resulting mean values may also be attributed to the choice being limited to five options: including more answer possibilities could be considered for allowing more divergence to lead to more clearly differentiated findings on students' IL competences. Also, the questions that were enquired using a Likert scale could better be analysed when plotting the median values for each answers with the help of a boxplot graph that also show the variance of the given answers (rather than relying merely on the mean as this quick scan does now). The limitations of qualtrics and its analytical tools were accepted for this quick scan, but perhaps one would like to choose a more comprehensive approach for the follow-up survey.

The choice of how to proceed concerning these methodological concerns depends on which aims and purposes the UB and UM pursue with their future research into the topic and how they want to make use of the outcomes. For instance, if one wants to focus more exclusively on those students who frequent the library's premises, one might argue for mostly sampling students at this location. Conducting the interviews primarily at the library locations with the help of the library students (as was largely the case for this quick scan), might then be suitable. Depending on which population one wants to learn about, one might also decide to send the survey to all registered students via their university email accounts: this might result in a rather low response rate, but it would theoretically give all students the same probability of being included in the sample and thereby make the results more representative and potentially also more useful for future decisions on how to approach or improve IL competences at UM.

Practical recommendations

Following from the previously mentioned conceptual and methodological recommendations, some more practical and overarching conclusions can be drawn within the present report: while effectively searching for and critically assessing information can be seen as an integral part of PBL and IL and as such might need to be incentivised more from an institutional perspective, more courses at UM might be encouraged to instruct their students to search for literature actively in the PBL class setting. In cooperation with ongoing research at EDLAB, the UB might also stress the necessary engagement of students within their classes and the search for information for PBL to function well.

Based on the positive (researching) experiences students can gain from working with online media, such as i.a., blogs, vlogs, wikis, UM and UB could increase the scope and importance of already existing programmes and incentives to foster students' informed and critical use with such technology, as e.g., the Wikimedia cooperation under the guidance of Vivian van Saaze and Odin Essers as part of the FASoS course "Sharing cultures". Students are mostly not encouraged to use Wikipedia as a main source of information by their university instructor; however, students might be pointed towards Wikipedia as a starting point for research more and more often, and instructors' stance towards Wikipedia might also be changing. Therefore, looking into such (new) online research possibilities and developments further, especially also the democratising aspects that might correlate with such movements, could be fruitful for UB and UM. In this same sentiment, UM and UB could also strive for a heightened awareness of students of how to use available tools and methods to find quality academic sources and how to avoid informal and illegal channels in this

process. Tools such as e.g., Unpaywall are not very well known, yet, and they might be promoted more (actively) by the library, particularly also as alternatives to Sci-Hub and other questionable sources.[32]

In awareness of students' low understanding and use of bibliographic management systems, UB could consider enhancing the offering or marketing of courses on such tools to increase their popularity among students. While there are repeated skills courses and sessions on EndNote, the library might also increase their support to free and open source bibliographic management systems, such as Zotero (which are more compatible with the previously mentioned democratising potential of the library in general, and also more in line with furthering research for non-commercial and more inherently academic-driven motivations).

Conclusion

This report investigates research practices of UM students and comes to several conclusions and resulting recommendations for continuing the education and support of IL competences, focussing on how students access and assess academic information and its quality.

Sources for papers and in the PBL context. Students regularly conduct independent literature searches for their papers. However, they are more often provided with fixed literature lists for their problem-based learning (PBL) classes, which means that they often miss out on learning how to effectively search for and critically assess academic information for their class discussions.

Library catalogue and resources. The majority of students regularly use the LibSearch tool of the UM for gaining access to information resources. Approximately half of the students use the LibSearch tool for the discovery of new sources – other (general) search engines seem to also be very popular for researching (new) sources.

Frequent online sources. Google, Studydrive, and Facebook are used frequently for students' research; students refer to YouTube, online blogs, and vlogs quite regularly, as well. On the one hand, and in a negative sense, this means a reliance of students on potentially informal and unacademic sources, as well as a dependency on monopolist and economically-driven international corporations (which is questionable from a political point of view). The easy and immediate accessibility of online sources might also dampen students' awareness of the struggles and persistence research requires. On the other hand, and in a positive sense, the use of online media can also mean a broad variety of experiences in critical thinking and enrichment in students' information literacy competence repertoire by including current and up-to-date media and technologies, a proficiency of which is necessary for future academic and non-academic professions.

Organising sources. Less than one third of all students use bibliographic management systems. EndNote is most popularly used by the students, Zotero and Mendeley less so. Additionally, many students confuse generic reference producing websites with proper bibliographic management systems; this shows that they are not aware of the comprehensive functions of bibliographic management systems. Combined with a low tendency to document search activities and the lack of organising found sources, comprehensive and reproducible thus research becomes difficult.

Sharing sources. While students mostly share resources with each other through their email accounts, also Facebook, Google Drive and Google Docs are increasingly popular – it remains to be seen how this reliance on profit-driven providers concerning potentially sensitive research data is to be evaluated.

Comparisons between faculties and study years. Since the overall and the sectional sample sizes were smaller than expected, the results of this survey are not representative or generalisable. Especially the

[32] See http://unpaywall.org

Master's students sample was too small to make specific statements about the Masters' students' population at UM. The comparison between faculties and study years within the Bachelor's students' sample is problematic for the same reasons. Generally (and with these limitations in mind), Master's and more advanced students in the sample seem to be slightly more accustomed to and successful in their literature research than the questioned Bachelor's students and there seem to be disciplinary differences between students' experiences with different research types and intensities (while this is also implied by common sense, more research could shed light on the underlying causalities and more precise conditions). However, Bachelor's students seem to me more flexible, methodical, and communicative in and about their research and its documentation procedures, which can be seen as an adaptive and creative approach to dealing with issues.

Questionable research practices. While students resorting to questionable research (or even illegal) practices for their research cannot be desirable from an institutional research standpoint, it can be positively observed that students do not rely as heavily on sources such as Sci-Hub as might have been anticipated. Whether this means that students largely use legal manners to acquire resources might be investigated further; however – there might also have been a 'response bias' in the survey preventing us from gaining more insight into these elements of researching habits.

General information literacy competences. When examining the findings of how students access and assess academic information, some tentative conclusions about the overarching information literacy framework can be made. Based on the findings, one can conclude that there seem to be differences in degrees of IL competences between students at UM. The fact that there is only a small difference between successfully finding sources and not gaining access to required resources invites questions, however. Further research is needed to look into determining how precisely IL competences can best be measured, quantified or qualified, and assessed from an institutional (UB and UM) perspective.

This illustrates how when becoming more experienced at defining and measuring IL competences among students, one can also become more aware of and skilled at teaching and conveying such skills to students. One has to note that this is only the beginning of a process, which is well under way in many positive ways already. Future research might shed light on even more fruitful and successful paths for IL education at UM and UB. Therefore, this report thus concludes with the following recommendations:

Conceptual recommendations. Future research into IL competences at UM and UB could make use of and further elaborate the IL competences framework as a benchmark to evaluate students' abilities to access and assess academic information. A wider scope in researching these competences could be achieved e.g., through additionally conducting an in-depth analysis of how students apply IL competences practically within written assignments, and by asking instructors (course coordinators and tutors) of UM to critically reflect on their impressions of and expectations for IL competences (education).

Methodological recommendations. In light of this report's findings, and in order to be fully functional to guide concrete recommendations as to how IL education can be improved, more precise data need to be collected. There are two main alternative research approaches that could be followed in the future: Firstly, one could opt for a quantitative statistical approach. This could be achieved by selecting a representative sample of participants from the respective student population(s) one would like to investigate, and by employing a more thorough statistical analysis of the data. Secondly, one could opt for a qualitative approach that is based on discourse analysis and works with in-depth analyses of interviews and the interviewees' perceptions and motivations. Both approaches could benefit from the wider research scope that is mentioned under the previous conceptual recommendations.

Practical recommendations. Effectively searching for and critically assessing information can be seen as an integral part of PBL and IL and as such might need be incentivised more from an institutional perspective: more courses might be encouraged to instruct their students to search for literature more actively in the PBL class setting. Further research could also look into how literature is assigned or being searched for within the PBL context concretely. Since there are different ways in which students might be accustomed with a critical assessment of academic information, the different options that are in practice at UM might need to be investigated in greater focus. Based on the positive (researching) experiences students can gain from working with (new) online media, such as i.a., blogs, vlogs, wikis, UM and UB could increase the scope and importance of already existing programmes and incentives to foster students' informed and critical use with such technology, as e.g., the already ongoing Wikimedia cooperation. The UM and UB could also strive for a heightened awareness of students of how to use available tools and methods to find quality academic sources and how to avoid informal and illegal channels in this process. In awareness of students' low understanding and use of bibliographic management systems, UB could consider enhancing the offering or marketing of courses on such tools to increase their popularity among students.

To return to the hypotheses mentioned in the introduction, thus, the following conclusions can be drawn:

1. *Inter-individual differences*. While there seem to be differences in the students' mastery of skills and competences to access and assess (academic) information, generally most students were found to have developed basic approaches to dealing with researching information sufficiently. Since the results from this quick scan are to imprecise for very detailed or even causal interpretations, further research is needed into how IL competences in general may be evaluated and improved. This also strongly links in with the following hypothesis:
2. *Knowledge utilisation*. From our quick scan, we were able to draw some general conclusions and formulate potential paths for future research. The findings we gained are not representative or generalisable, but present fruitful starting points and need to be investigated further.
3. *LibSearch*. While students do not always seem to refer to UB's LibSearch tool in a very enthusiastic manner, they do use the tool consistently and regularly, as well as search engines such as Google.
4. *Sharing resources*. Students use and share literature via social media, blogs, vlogs, or other communities or platforms online. While there are many positive elements to be located in these developments, more support and critical reflection is needed to guide students to use the technological possibilities in a constructive and beneficial manner, especially in light of the potentially negative aspects, such as:
5. *Informal, questionable, and illegal resources*. Generally, this hypothesis was not found to be as problematic as anticipated, but future endeavours should still attempt to help raise awareness of these research pitfalls and how to avoid them. Since students seem to be somewhat unaware of the dangers of informal and sometimes questionable information resources, more focus might be given to IL competence trainings and support. The previous recommendations outline some ways in which this might be achieved.

As was discussed above, in their studies, university students should *not* only make use of the recommended literature provided by their course coordinators and tutors but also go beyond this with their own creative research. Being able to distinguish useful from misleading information is an important competence for students, instructors, and general citizens alike: gaining access to information means gaining access to power and ultimately to shaping the world we live in. Being able to exert information literacy, thus to create order, meaning, and purpose within the plethora of available (academic) information in a certain field and to find answers to the questions one needs answered, is a key competence for students within UM's and UB's

education. Thus, knowing how well students are able to effectively access and critically assess (academic) information is a key step towards continuing to improve information literacy education at UM and UB.

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Appendix 1: Survey

How do you search for academic information?

Q1 Welcome to our survey on how students find academic information at the UM! Participating in this survey will take 10-15 minutes. Among all participants, we will raffle off 5 x 10€ vouchers! We will process your responses anonymously and only use your email address for the voucher lottery. So, to have a chance to win the voucher and help the library understand your information seeking behaviour better, get started!

Q2 Please indicate the type of degree you follow at the UM.

❍ Bachelor

Master

Q3 Which year of the programme are you currently following?

1

2

3

3+

Q4 Which year of the programme are you currently following?

1

2

2+

Q5 Where did you obtain your Bachelor's degree?

- ❑ Maastricht University
- ❑ Another university inside the Netherlands
- ❑ Another university outside of the Netherlands
- ❑ Other comparable degree(s) obtained elsewhere, please specify: _____

Q6 At which faculty do you study? (more than one answer possible)

- ❑ Faculty of Arts and Social Sciences
- ❑ Faculty of Health, Medicine, and Life Sciences
- ❑ Faculty of Humanities and Sciences
- ❑ Faculty of Law
- ❑ Faculty of Psychology and Neuroscience
- ❑ School of Business and Economics
- ❑ Other, please specify: _____

Q7 What is your specific programme? (optional)

Q8 Which attributes do you look for when choosing an academic resource (for a course, paper, presentation, etc.)?

Academic publication (as opposed to commercial, journalistic, or popular science).	❍				
Published in well-known					

academic journal or by a reputable academic publisher. Peer-reviewed. Author is prominent/competent researcher in the field. Recently published/updated (only if recency is of importance in the discipline). Contains references to key texts and concepts in field of enquiry. Mission statement of the journal or publisher is trustworthy.					
Keywords and abstract fit my field of enquiry.					

Q9 Are there attributes missing that you find relevant to determine the quality of a source?

No, the previous options cover the relevant attributes.

Yes, there are other relevant attributes (please specify): _____

Q10 How often do you need to perform a literature search for a task, paper, or presentation?

every week

1-2 times per month

1-2 times per semester

Other time interval, please specify: _____

Q11 Which tools and strategies do you use to access information resources? (more than one answer possible)

- ❑ LibSearch (the library's search engine)
- ❑ Google
- ❑ Google Scholar
- ❑ Another search engine (instead of Google), please indicate which one(s): _____
- ❑ A (discipline-specific) database, such as PubMed, EBSCO, Web of Science
- ❑ I go to the library and browse through the shelves/open stacks for potentially interesting sources.
- ❑ I ask fellow students, tutors, or course coordinators for help.
- ❑ Other option(s), please specify: _____

Q12 For which types of searches do you use LibSearch (the library's search engine)? (more than one answer possible)

- ❑ To determine the location of books in the open stacks in the library.
- ❑ To order books from the library's closed stacks.
- ❑ To find articles of which I already know the title but do not yet have access to.
- ❑ To enter search terms and find previously unknown publications.
- ❑ Other option(s), please specify: _____

Q13 For the literature you use in your PBL classes, how often do the following scenarios occur?

Fixed literature lists are given to students (no literature necessary beyond this list). Fixed literature list is given and additional readings need to be	❍				

found by students themselves.					
Completely independent literature research by students.					

Q14 How are you provided with access to the literature for the PBL tasks?

Via the Student Portal (to download). Reading list (but have to find out myself how to access the sources). At the library for me to read/copy (e.g. in a learning and resource centre). On a (USB-)stick.					
As a hardcopy in class.					

Q15 Are there other ways in which you are provided with access to the literature for the PBL tasks?

No, the previous options cover the relevant ways of accessing literature.

Yes, I would like to add the following way(s) of accessing literature for my PBL tasks (please fill in the box):

_____

Q16 How often do you encounter the following scenarios when trying to gain access to resources (for papers, assignments, classes, etc.)?

Online access to resources (full texts) through 'regular' search engine. Online access to resources (full texts) through the library's databases and in the library's collection (e.g. via Student Desktop Anywhere). I do not use the Student Desktop Anywhere and thus cannot access the library's subscriptions from home. Necessary resources (full texts) are behind a paywall (and the library does not have access to it). Resources (full texts) ordered via the inter-library loan (PiCarta). Inter library loan (PiCarta) is too expensive and/or cumbersome and thus not an option for me.					
No access to the necessary resources (full texts).					

Q17 Are there other scenarios you come across when trying to gain access to resources?

No, the previous options cover the relevant scenarios.

Yes, I would like to add the following scenario(s) for trying to gain acess to resources (please specify):

_____

Q18 How do you seek help when struggling with finding useful literature for a paper or an assignment? (more than one answer possible)

- ❑ I enter my main search terms into a general search engine (please indicate which search engine you use): _____
- ❑ I make use of the library's online support on searching for sources and doing research.
- ❑ I ask the library staff for help.
- ❑ I visit PeerPoint and ask for help.
- ❑ I visit my faculty's Writing Centre.
- ❑ I consult my tutor or course coordinator.
- ❑ I speak to fellow students in the course and ask for help and ideas.
- ❑ Other, please specify: _____

Q19 When a necessary resource (full text) is difficult to obtain (e.g. also not available through the inter-library loan), which of these options do you choose and how often?

Turning to the abstract only and try to extract as much information as possible from it. Searching for a similar source in the same journal. Looking for a source by the same author. Searching for a source with the same or similar key words. Looking for a source with a similar title.	❍				
Ignoring this particular idea anyway.					

Q20 Are there other options you turn to when a necessary resource (full text) is difficult to obtain?

No, the previous options cover the relevant options.

Yes, I would like to add the following option(s) (please specify): _____

Q21 How often do the following scenarios occur concerning papers you write for your courses?

The topics are fixed and predetermined literature lists are assigned. The topics are fixed but students search for literature themselves.					
The choice of topic is free and students search for literature themselves.					

Q22 Have you come across different scenarios concerning the way you find/receive a topic and literature for your papers?

No, the previous scenarios cover the relevant scenarios.
Yes, I would like to add the following scenarios (please specify): _____

Q23 How do you search for information resources on a certain topic when no literature list is given? (more than one answer possible)

- ❑ I start by defining my search terms and then stick to them.
- ❑ I modify my search terms while researching and gaining more insight into the topic.
- ❑ I document my search strategy (i.e. keeping track of used search terms and consulted information resources).
- ❑ I let myself be guided mostly by intuition and interest (i.e. starting to read somewhere and following interesting ideas as they come up).
- ❑ Other options, please specify: _____

Q24 How do you determine when you have gathered enough resources for an assignment?

Q25 How often do you use the following social media platforms, online communities, blogs, or vlogs to gain access to resources (full texts)?

Sci-Hub Academia.edu Studydrive Facebook groups (please specify): Facebook messages/chats YouTube or other video platform (please specify):	❍				
Online discussion forums (please specify):					

Q26 Do you also use other services to gain access to resources (full texts)?

No, the previous options and services cover the relevant ways of gaining accessing to resources.
Yes, I also make use of the following options and services to gain access to resources (please specify):
_____

Q27 Do you share resources (full texts) with fellow students?

Yes, quite often.
Yes, sometimes.
No, never.

Q28 How often do you make use of the following services to share resources (full texts) with fellow students?

Email Dropbox Facebook Studydrive					
Via USB stick					

Q29 Do you use other services to share resources (full texts) with fellow students?
No, the previous options cover the relevant services of sharing resources.
Yes, I also make use of the following services for sharing resources (please specify):
_____

Q30 Do you use tools or software to organise and manage your sources (such as reference, citation, or bibliographic management software)?
No, I do not use any specific tools or software to organise and manage my sources.
Yes, I make use of tools or software to organise and manage my sources.

Q31 Which particular tool(s) or software application(s) do you use to manage and organise your sources? (more than one answer possible)
- ❑ EndNote
- ❑ Zotero
- ❑ Mendeley
- ❑ In-built reference managing system of my writing software
- ❑ Other option(s), please specify: _____

Q32 If - based on some of the previous questions or just out of curiosity - you are interested in more information on the discussed topics, take a look at our learning resources and support pages:
http://library.maastrichtuniversity.nl/skills-and-support/
Here we offer workshops, online tutorials, and many more interesting resources for your studies!

Please enter your email address if you want to participate in the lottery. (optional)
Your address will not be linked to your given answers; your information will be treated confidentially.

Thank you very much for your participation in this survey! With your help, we can improve our student support!
We will inform the winners of the vouchers within a few weeks of completing this survey.

Good luck with your (literature) research and academic endeavours in the future!

Appendix 2: Student information

Bron: Be-informed - Onderwijs - Studentenaantallen - Inschrijvingen (jaarverlag)

Students: Total number of registrations

Academic Year 2016
Academic Session 1 Sept
Status active Active oct 1st
Regular/Non-regular Regular
Key Figures Total number of registrations

	Total number of registrations	Total number of registrations	Total number of registrations	Total number of registrations	Total number of registrations	Total number of registrations	Total number of registrations	Total number of registrations
Academic Year	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**
Program Type | Faculty	**Result**	**UM**	**FHML**	**FPN**	**SBE**	**FdR**	**FASoS**	**FHS**
Bachelor	10.961	10.961	2.785	1.106	3.145	1.568	1.256	1.101
Master	5.647	5.647	1.999	678	1.153	1.238	272	307
Partner program master	253	253	163					90
Overall Result	16.861	16.861	4.947	1.784	4.298	2.806	1.528	1.498

Students: Total number of unique students

Academic Year 2016
Academic Session 1 Sept
Status active Active oct 1st
Regular /Non Regular Regular
Key figures Total number of unique students

	Total number of Unique students	Total number of Unique students	Total number of Unique students	Total number of Unique students	Total number of Unique students	Total number of Unique students	Total number of Unique students	Total number of Unique students
Academic Year	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**
Program Type | Faculty	**Result**	**UM**	**FHML**	**FPN**	**SBE**	**FdR**	**FASoS**	**FHS**
Bachelor	10.844	10.844	2.742	1.106	3.134	1.549	1.255	1.101
Master	5.234	5.234	1.941	676	1.076	1.013	270	306
Partner program master	252	252	163					89
Result	16.302	16.302	4.829	1.782	4.210	2.557	1.525	1.496